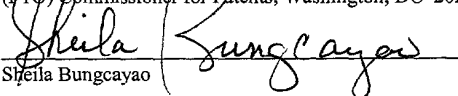


FORM PTO-1390 (REV 10-2000)		U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE	ATTORNEY'S DOCKET NUMBER 31799/242724
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371			U.S. APPLICATION NO. (If known, see 37 C.F.R. 1.5) <b>10/030679</b>
INTERNATIONAL APPLICATION NO. PCT/ES00/00247	INTERNATIONAL FILING DATE July 12, 2000	PRIORITY DATE CLAIMED July 13, 1999	
TITLE OF INVENTION A BUILDING PANEL AND PLANT FOR THE MANUFACTURE THEREOF			
APPLICANT(S) FOR DO/EO/US Carlos Fradera Pellicer			
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:			
<ol style="list-style-type: none"> <li>1. <input checked="" type="checkbox"/> This is a <b>FIRST</b> submission of items concerning a filing under 35 U.S.C. 371.</li> <li>2. <input type="checkbox"/> This is a <b>SECOND</b> or <b>SUBSEQUENT</b> submission of items concerning a filing under 35 U.S.C. 371.</li> <li>3. <input checked="" type="checkbox"/> This is an express request to promptly begin national examination procedures (35 U.S.C. 371(f)).</li> <li>4. <input checked="" type="checkbox"/> The US has been elected by the expiration of 19 months from the priority date (PCT Article 31).</li> <li>5. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371(c)(2)) <ol style="list-style-type: none"> <li>a. <input checked="" type="checkbox"/> is attached hereto (required only if not communicated by the International Bureau).</li> <li>b. <input checked="" type="checkbox"/> has been communicated by the International Bureau.</li> <li>c. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US).</li> </ol> </li> <li>6. <input checked="" type="checkbox"/> A English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).</li> <li>7. <input type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)) <ol style="list-style-type: none"> <li>a. <input type="checkbox"/> are attached hereto (required only if not communicated by the International Bureau).</li> <li>b. <input type="checkbox"/> have been communicated by the International Bureau.</li> <li>c. <input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired.</li> <li>d. <input type="checkbox"/> have not been made and will not be made.</li> </ol> </li> <li>8. <input type="checkbox"/> An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).</li> <li>9. <input checked="" type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).</li> <li>10. <input type="checkbox"/> An English language translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).</li> </ol>			
Items 11. To 16. Below concern other document(s) or information included:			
<ol style="list-style-type: none"> <li>11. <input type="checkbox"/> An Information Disclosure Statement under 37 C.F.R. 1.97 and 1.98.</li> <li>12. <input type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.</li> <li>13. <input checked="" type="checkbox"/> A FIRST preliminary amendment. <input type="checkbox"/> A SECOND or SUBSEQUENT preliminary amendment.</li> <li>14. <input type="checkbox"/> A substitute specification.</li> <li>15. <input type="checkbox"/> A change of power of attorney and/or address letter.</li> <li>16. <input checked="" type="checkbox"/> Other items or information: Formal Drawings (11 sheets) International Preliminary Examination Report (Form PCT/IPEA/409)8</li> </ol>			

U.S. APPLICATION NO. (If known, see 37 CFR 1.50) <b>10/030679</b>		INTERNATIONAL APPLICATION NO PCT/ES00/00247		ATTORNEY'S DOCKET NUMBER 31799/242724	
17. <input checked="" type="checkbox"/> The following fees are submitted:				CALCULATIONS	PTO USE ONLY
<b>Basic National Fee (37 CFR 1.492(a)(1)-(5)):</b> Neither international preliminary examination fee (37 CFR 1.482) nor International search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO <span style="float: right;"><b>\$1,040.00</b></span>					
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO <span style="float: right;"><b>\$ 890.00</b></span>					
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search (37 CFR 1.445(a)(2)) paid to USPTO <span style="float: right;"><b>\$ 740.00</b></span>					
International preliminary examination fee (37 CFR 1.482) paid to USPTO But all claims did not satisfy provisions of PCT Article 33(1)-(4) <span style="float: right;"><b>\$ 710.00</b></span>					
International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) <span style="float: right;"><b>\$ 100.00</b></span>					
<b>ENTER APPROPRIATE BASIC FEE AMOUNT =</b>				<b>\$ 1040.00</b>	
Surcharge of <b>\$130.00</b> for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)).				\$	
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total Claims	34 -20 =	14	<b>X \$18.00</b>	<b>\$ 252.00</b>	
Independent Claims	2 - 3 =	0	<b>X \$84.00</b>	<b>\$ 0.00</b>	
MULTIPLE DEPENDENT CLAIM(S) (if applicable)				<b>+ \$280.00</b>	<b>\$ 280.00</b>
<b>TOTAL OF ABOVE CALCULATIONS =</b>				<b>\$ 1572.00</b>	
<input checked="" type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by one-half.				<b>\$ 786.00</b>	
<b>SUBTOTAL =</b>				<b>\$ 786.00</b>	
Processing fee of <b>\$130.00</b> for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)).				\$	
<b>TOTAL NATIONAL FEE =</b>				<b>\$ 786.00</b>	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). <b>\$40.00</b> per property +				\$	
<b>TOTAL FEES ENCLOSED =</b>				<b>\$ 786.00</b>	
				Amount to be Refunded	\$
				Charged	\$
a. <input type="checkbox"/> A check in the amount of \$ _____ to cover the above fees is enclosed. b. <input checked="" type="checkbox"/> Please charge my Deposit Account No. 16-0605 to cover the above fees. A duplicate copy of this sheet is enclosed. c. <input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 16-0605.					
Note: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137 (a) or (b)) must be filed and granted to restore the application to pending status.					
SEND ALL CORRESPONDENCE TO: Jason P. Cooper _____ SIGNATURE REGISTRATION NUMBER 38,114 <b>ALSTON &amp; BIRD LLP</b> Bank of America Plaza 101 South Tryon Street, Suite 4000 Charlotte, NC 28280-4000 Tel Charlotte Office (704) 444-1000 Fax Charlotte Office (704) 444-1111 <b>Customer Number 00826</b>			<b>"Express Mail" Mailing Label Number EL910631071US</b> Date of Deposit: January 11, 2002  I hereby certify that this paper or fee is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date indicated above and is addressed to BOX PCT, Attn: DO/US (PTO) Commissioner for Patents, Washington, DC 20231.  Sheila Bungcayao		

IN THE UNITED STATES DESIGNATED OFFICE (DO/US)

In re: Carlos Fradera Pellicer  
International Appl. No.: PCT/ES00/00247  
International Filing Date: July 12, 2000  
For: A BUILDING PANEL AND PLANT  
FOR THE MANUFACTURE THEREOF

Attn: DO/US

#3/  
a

January 11, 2002

Box PCT  
Commissioner for Patents  
Washington, DC 20231

**PRELIMINARY AMENDMENT**

Sir:

Please amend the above-identified application as follows:

In The Abstract:

Please replace the title with the following:

**A BUILDING PANEL AND PLANT FOR THE MANUFACTURE THEREOF**

Please replace the abstract paragraph with the following:

This building panel consists of a lightweight panel for external or internal closures of latticework support structures, which is constituted by slabs of air-setting resistant material. The slabs are reinforced in the façade panels for external closures and unreinforced for the dividing panels for internal closures. They are provided with a patterned surface on the visible face and are smooth or shaped at the edges. The visible face is formed by a thin layer of molded synthetic resin or fine mortar paste. When the layer is molded synthetic resin and is disposed as a shell for the panel, it comprises over the whole of the inner surface thereof an internal synthetic resin layer, the entire free surface of which is covered with a solid bulk material, the components of which are firmly partially anchored in said internal layer and afford a substantial free surface for anchorage of the air-setting material forming the resistant body poured thereover. This material fills the entire volume of said panel shell, at the same time as it includes therein reinforcement means provided with points directly accessible from the outside of the concealed face of the panel.

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In The Specification:

Please replace the title with the following:

**A BUILDING PANEL AND PLANT FOR THE MANUFACTURE THEREOF**

In The Claims:

Please amend Claims 7, 8, 10, 11 and 31 to read as follows:

7. (Amended) The panel of claims 1 or 4, wherein the reinforcement means (7B) comprise metal sections constituting the visible face (12) of the edges (3a) of the panel (1).

8. (Amended) The panel of claim 4, wherein the section (7B) constituting the edges of the panel is an angle section and the web (12) thereof is wider than the thickness of the edges and is folded orthogonally parallel to the surface of the concealed face of the panel to form an anchorage tab (13), which may have a stiffening flange (14) directed towards the surface of said concealed face (8) of the panel (1).

10. (Amended) The panel of claim 6, wherein the metal sections (7A, 7B, 23) are provided with apertures (15) in the webs and/or seating wings thereof allowing the passage of the mass of resistant material of the body (22), so as intimately to embrace part of the body of the metal sections (7A, 7B, 23).

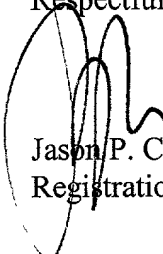
11. (Amended) The panel of claim 6, wherein some of the metal sections (7A, 7B, 23) are situated lengthwise (23A) and others crosswise (23B) relative to the panel (21), forming a frame arrangement.

31. (Amended) The plant of claims 25 or 26, wherein the shelving tunnels (a, k) are provided with means for heating and/or stacking the loaded mold carriers.

REMARKS

The above amendments are made to more clearly define the invention under United States practice. Please enter this amendment prior to calculation of the filing fee.

Respectfully submitted,

  
Jason P. Cooper  
Registration No. 38,114

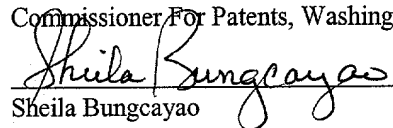
**ALSTON & BIRD LLP**

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101 South Tryon Street, Suite 4000  
Charlotte, NC 28280-4000  
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**Customer No. 00826**

**CERTIFICATE OF EXPRESS MAILING**

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Sheila Bungcayao

**Version With Markings to Show Changes Made:**

**In The Claims:**

Please amend Claims 7, 8, 10, and 31 to read as follows:

7. (Amended) The panel of claims 1 or [and] 4, wherein the reinforcement means (7B) comprise metal sections constituting the visible face (12) of the edges (3a) of the panel (1).

8. (Amended) The panel of claim[s] 4 [and 7], wherein the section (7B) constituting the edges of the panel is an angle section and the web (12) thereof is wider than the thickness of the edges and is folded orthogonally parallel to the surface of the concealed face of the panel to form an anchorage tab (13), which may have a stiffening flange (14) directed towards the surface of said concealed face (8) of the panel (1).

10. (Amended) The panel of claim[s] 6 [and 7], wherein the metal sections (7A, 7B, 23) are provided with apertures (15) in the webs and/or seating wings thereof allowing the passage of the mass of resistant material of the body (22), so as intimately to embrace [] part of the body of the metal sections (7A, 7B, 23).

11. (Amended) The panel of claim[s] 6 [and 7], wherein some of the metal sections (7A, 7B, 23) are situated lengthwise (23A) and others crosswise (23B) relative to the panel (21), forming a frame arrangement.

31. (Amended) The plant of claims 25 or [and] 26, wherein the shelving tunnels (a, k) are provided with means for heating and/or stacking the loaded mold carriers.

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- 1 -

## A BUILDING PANEL AND PLANT FOR THE MANUFACTURE THEREOF

DESCRIPTION5 Field of the Invention

10 This invention relates to a building panel and to a plant for the manufacture thereof. To be precise, it relates to a lightweight panel for external or internal closures of latticework support structures, formed by uprights connected by horizontal crossmembers. The panel is formed by slabs of air-setting resistant material which are reinforced in the façade panels for external closures and unreinforced in the dividing panels for internal closures and which have a patterned surface on the visible face thereof and a smooth or shaped surface at the edges thereof. The surface is formed by a thin layer of a synthetic resin or a fine mortar paste. The layer is formed as a shell partially enveloping a body of air-setting resistant material on which it confers a quality finish of architectural type with essential properties of resistance to weathering and environmental pollution and is formed in molding arrangements constituted by a mold-holder having an engraved bottom wall, on which there is seated the mold forming the pattern of the visible face, the mold being made of polyurethane, silicone, etc and being surrounded by side members shaping the edges of the slabs. This shell, after solidification, forms the mold for the said air-setting resistant material.

25 Prior Art Reference

30 Building panels meeting the specifications contained in the foregoing generic description are known from Spanish Utility Model 9900014 of the present applicant. In said document there is contemplated the formation of the surface of the visible face and the edges of the panel by molding at least three layers of synthetic resin.

Such building panels have drawbacks such as, in principle, the difficulty of forming an intimate bond between the synthetic resin layer, forming the visible surfaces of the panel and the resistant body material,

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particularly when this material consists of an air-setting hydraulic material, such as a cement or lime mortar, concrete, plaster and the like.

To overcome this problem of bonding the two materials together, the solution was adopted of inserting between them a layer having affinity to both, such as a layer of a hydrolysable resin. While the foregoing solution is generally sufficient for its task, it is delicate to carry out since it depends on many factors which are hard to control in industrial production to the extent that, under extreme environmental conditions, the patterned layer may separate from the resistant material body.

Also, a further drawback detected in the panels disclosed in the aforementioned Spanish Utility Model 9900014 is that the means provided for attaching the panel to a support structure are internal to the panel and are complex, artificial and hard to use, providing for unreliable attachment, which is quite unacceptable in a building, where these support structures are of lattice type formed essentially by metal upright sections which are connected by horizontal metal cross-member sections, with the ensemble being stabilized by strutting.

According to the regular practice, the façade panels are attached to the support structure by way of stirrups which are anchored in the mass of the structure, by a tongue-and-grooved arrangement or engagement in notches in the openings of the structure and fixation thereof by masses of cement, by screwing, by welding of stirrups, frames or couplings to metal sections of the structure, etc. All these systems suffer from the drawback that they are complex, require scaffolding and shuttering in the majority of cases, require specialized labor and are not absolutely reliable in situations of movement of the structure due to settling thereof, to the action of gale force winds, earthquakes, explosions, etc.

Furthermore, when prefabricated panels reproducing architectural type patterns on the visible face thereof, such as stone masonry, brickwork, carvings or other designs, are set side-by-side, the joints formed longitudinally and transversally therein are extremely obvious, breaking the aesthetics of the pattern design.



Thus, in façade panels imitating brickwork, where the bricks are arranged in break joint courses, it is obvious that a panel of this type will have at the vertical edges thereof bricks of one course whose edges coincide with the edge of the panel and bricks in adjacent courses which  
5 are split in half. This arrangement reveals the imitation, which is unaesthetic and impossible to hide with putties and the like. This is a limitation for the use of such façade panels imitating brickwork.

The same happens with façade panels imitating natural stone masonry, in which case it is much more difficult to disguise the straight lines  
10 of the joints, since the joints between the stones are very irregular and in no case are they straight.

In other cases, which are very frequent in the new building trade techniques, it is normal to install internal plasterboard, fiberboard, etc slabs which are used in heterogeneous wall structures to accompany a  
15 prefabricated façade panel and form a thermal and acoustical insulation space in cooperation with another similar slab, in this case made from plasterboard which, acting as internal closure of the wall, forms the visible face thereof inside the room so formed. Thus, in the building trade, it is a regular practice, particularly in the case of buildings formed by a lattice  
20 support structure formed by wooden beams or light metal sections, to attach the façade closure panels to the lattice support structure with screws, with the insertion of one of said internal plasterboard, fiberboard panels, etc.

This assembly system has the drawback that the movements due to  
25 settling of the structure, to the effects of wind, to snow loads, to seismic movements, structural vibrations, explosions or others cause relative movements between the members of the lattice structure and the façade panels, causing deterioration of said internal slabs by the sawing action caused therein by the ensemble attachment screws, which changes the  
30 distance between the lattice structure and the façade panels. As a result, the drawback arises that such panels are placed in a swaying situation, leading not only to an aesthetic deterioration, but also to the risk of

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separation and, furthermore, the structure loses the strutting effect offered by said internal slabs.

Lightweight façade panels made substantially by individual molding of a mass of cement mortar with the inclusion of a metallic reinforcement, such as the embodiments disclosed in Spanish patent 9900369 and utility models 9900014 and 9901847, of the present applicant, are known. These are manufactured in known plants in which to prepare the prefabricated items of mortar or concrete, long heated tracks are used on which the molds are placed. Firstly, the reinforcement members are placed in them and, thereafter, the mortar or concrete is poured and vibrated. After this, the molds are allowed to rest, until a sufficient degree of setting has been attained to be able to strip the molds and stack the pieces obtained until setting is complete.

These plants require large spaces to lay out the tracks, a high energy consumption to heat the tracks, moving means for placing and installing the reinforcement and other, also moving, means for pouring and vibrating the concrete, all of which means that such plants are extremely burdensome and hardly competitive, to which there should be added the enormous number of molds required for a profitable manufacturing operation.

#### Summary of the Invention

In view of the foregoing, it would be desirable to have a building panel fulfilling the largest number of the following conditions:

1. have unbeatable conditions of adhesion of the patterned layer to the material of the resistant body.
2. be provided with reinforcement means which allow it to be attached to a lattice support structure, are easy to produce, may be accurately located and are completely reliable under extreme conditions.
3. coordinate the attachment thereof to the lattice support structure with the attachment of inside wall internal slabs.

4. comprise a buttstrap arrangement hiding the joints between panels having an architectural pattern.
5. be simple and speedy to manufacture with high quality in a plant which is economical in equipment and labor.

5 The building panel of the invention has been developed in accordance with the foregoing solution. Nevertheless, it may have other applications in decoration, industrial and civil protection, etc. In the panel, the molded synthetic resin layer, disposed as a shell therein, is provided over the whole of the inner surface thereof with an internal layer, also of  
10 synthetic resin, having the whole of the free surface thereof covered with a solid bulk material, the components of which, having a part thereof firmly anchored to said internal layer, provide a substantial free surface for the anchorage of the resistant material of the body applied thereover, which material fills the entire volume of said panel shell, at the same time as it  
15 incorporates therein reinforcement means provided with points directly accessible from the outside of the concealed face of the panel.

According to the invention, the solid bulk material is preferably constituted by an aggregate having a large specific surface area and, more precisely, by a sand formed by sharp-edged angular, preferably non-eroded  
20 grains. Also comprised within the idea of solid bulk material are metal shavings, metal fiber reinforcements, grit, etc.

According to the invention, the points of the internal reinforcement means accessible from the outside are located in such a way as to extend clearly from the surface of the concealed face of the panel. In any case, the  
25 points of the reinforcement means accessible from the outside are formed by parts of said reinforcement means emerging from the resistant body of the panel on the concealed face thereof. Thus, in a particular case, the reinforcement means comprise flanged top-hat-shaped means having a portion of the U-shaped part thereof projecting from the outside level of the  
30 hydraulic material on the concealed face of the panel, and the brim portions thereof are applied against the surface of the solid bulk material.

The invention also contemplates that the reinforcement means comprise metal sections forming the visible portion of the panel edges. One

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preferred embodiment contemplates that the section constituting the edges of the panel is an angle section and the web thereof is wider than the thickness the edges and is folded orthogonally and in parallel with the surface of the concealed face of the panel to form an anchorage tab which  
5 may have a stiffening flange directed towards the surface of said concealed face of the panel.

In all cases, it is deemed desirable that the metal sections are provided with apertures in the webs and/or seating wings thereof allowing the mass of resistant material of the body to pass therethrough, so as  
10 intimately to embrace a part of the metal section structure.

It is a further feature of the invention that some metal sections are situated lengthwise and others crosswise relative to the panel, forming a frame arrangement. In one case, the metal sections forming the frame arrangement may be accompanied by other metal sections disposed  
15 parallel to one and/or the other of the longer and shorter sides of said frame arrangement and, in all cases, the metal sections comprise corrugated rods transversely crossing said frame and metal section arrangements, said rods being fixedly attached to points thereof, and also optionally accompanied by open mesh wire netting, meshes, etc.

20 According to the invention, the material forming the body resistant to mechanical stresses of the construction is one of the group formed by: cement concrete, cement mortar, resin mortar, mixed hydraulic and resin mortar, plaster, lime mortar and synthetic resins, either normal or lightened, alone or in combinations thereof.

25 According to the invention, the resistant body of the panel may be formed by an inner layer of a heavy, air-setting resistant material, for the anchorage of the patterned layer and of part of the metal reinforcement sections, and an outer layer of a lightweight resistant material, completing the body, conferring a greater thermal and acoustical insulating power  
30 thereon and forming the concealed surface of the panel. Also according to the invention, the outer layer of the lightweight resistant material may be preformed as a prefabricated slab.

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According to the invention, the synthetic resin of the layer molded as a shell consists of a gel-coat of a resin of the group formed by polyesters, polyurethanes, phenolic resins and epoxy resins, either alone or in combination, incorporating, in all cases, a base coloring agent and, optionally, ornamental and/or distinguishing surface coloring arrangements.

One aspect of the invention has a special application, in the building trade, in the above mentioned case of the assembly of the internal plasterboard slabs, fiberboard slabs, etc., where, according to the invention, the internal slab is applied directly, independently of the façade panel, to the support structure, in such a way that it occupies one or more cells thereof and is flanked, in any case, by the corresponding upright and transverse sections, to which it is directly solely attached by screws or other means, at the wings thereof, or to another portion, at end points of the support structure lattice, occupying one or more of the cells thereof, in such a way as to replace the conventional herring-bone strutting.

To avoid the problems appearing in panels having a surface decorated with architectural relief (brickwork, masonry, etc), with a view to disguising the joints between panels, according to the invention the edges of the sides of the panel to be placed juxtaposed to the sides of other panels are provided, at the places on the visible face thereof where the joints cut across the relief of the pattern design, with slightly depressed areas, with those of an adjacent edge of one panel mating with those on the edge of the other panel. Once the panels are installed, these areas define depressed façade areas affecting part or the whole of the joint and in which inserts bearing the design are fitted to form the continuation of the pattern design on the visible faces of the juxtaposed panels.

With a view to manufacturing the panel of the invention under the best conditions, a plant has been devised comprising a track for the movement of carrier devices for the molds forming the façade panel on which there are situated sequentially according to the operative stages required for the manufacture of the façade panel a number of work stations which, defined by the means and/or members pertaining to the work stage proper thereto are listed in order below:

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- 5
- (a) means for cleaning the molds and/or mold carriers, appropriate for removing any mortar and mold stripper remains deposited thereon,
- (b) means for changing the molds, to be used only when the panel to be manufactured has different features from those of the panel which has been stripped from the mold, which means are complemented by shelving for use as a mold store,
- 10
- (c) means for applying a mold stripping product over the entire molding surface,
- (d) means for spraying over the entire molding surface a thin layer of a first resin (gel-coat) which waterproofs and enhances the pattern of the visible face of the panel,
- 15
- (e) a tunnel with shelving for storing the molds in the carriers thereof, in stand-by for the curing of the resin sprayed in the molds and/or for the following operation on the mold,
- (f) means for spraying a thin layer of a second anchor resin on the first resin layer,
- 20
- (g) means for spraying a layer of coarse grained material (such as sand, shot, etc.) on the second resin layer, so as partly to incrust said coarse grains in the resin and for removing the grains not adhering thereto;
- 25
- (h) a tunnel with shelving for storage of the carriers bearing the molds charged with both resins and the coarse grains incrustated in the second resin, in stand-by for the curing of the second resin and/or the following operation,
- 30
- (i) means for pouring cement mortar on the second resin and the coarse grains, which is prepared from the cement, aggregate, water and additives drawn from silos adjacent the station,
- (j) means for placing the reinforcement in the cement mortar and, optionally, a suspension cable for the panel anchored in said reinforcement,

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- (k) a tunnel kiln with shelving for the setting of the cement mortar, and
- (l) mold stripping means and shelving for stacking the finished panels.

5 A further feature of the invention resides in the fact that when the architectural features and the resins of the façade panels and, therefore, the polyurethane molds are not used, the molding surface is formed by the bottom wall of the mold carrier devices devoid of said molds, whereby the sequence of operative work stations is reduced to the following:

- 10 means for cleaning (a) the mold-free mold carrying devices, appropriate for removing any mortar and mold stripper remains,
- means for applying (c) a mold stripping product over the entire molding surface,
- a tunnel with shelving (h) for storing the mold carrier devices, in
- 15 stand-by for the following operation,
- means for pouring (i) cement mortar on the molding surface formed by the mold carrier devices, which is prepared from the cement, aggregate, water and additives drawn from silos adjacent the station,
- 20 means for placing (j) the reinforcement in the cement mortar and, optionally, a suspension cable for the panel anchored in said reinforcement,
- a tunnel kiln (k) with shelving for the setting of the cement mortar, and
- 25 mold stripping means (l) and shelving for stacking the finished panels.

#### Brief Description of the Drawing

Further features of the invention will be disclosed in the following  
30 description, with reference to the accompanying drawings, in which:

Figure 1 is a cross section view of a corner portion of a panel, corresponding to the outer patterned layer which, in shell-like fashion, shows one provided with its inner

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resin layer and a solid bulk material partly incrustated in said inner layer.

Figure 2 is a view of the shell portion according to Figure 1 to which a reinforcement means of the type formed by top-hat-shaped metal sections has been added.

5        Figure 3 is a view of a shell portion similar to the one shown in Figure 1, in which the part forming the panel edge is constituted by part of a reinforcement means.

10        Figure 4 is a detail of the cross section view of Figure 2, in which there has been incorporated the mass of material constituting the resistant body and showing how the patterned layer shell and the resistant body are anchored together.

Figure 5 is a cross section view of an end portion of a panel provided with the reinforcement means of Figure 2.

15        Figure 6 is a cross section view of an end portion of a panel provided with the reinforcement means of Figure 3.

Figure 7 is a plan view of a building panel showing an arrangement of the reinforcement means in which the latter form an edge frame.

Figure 8 is a cross section view on the line VIII-VIII of Figure 7.

20        Figure 9 shows a wall arrangement in which there is included a panel according to Figures 3 and 6, as an external closure member, and a conventional plaster board panel as internal closure.

25        Figure 10 is a side elevation view, partly in section, of an upper end portion of a façade panel confronting a node of the latticework structure constituted by a cross-member section attached to an upright section, the façade panel portion and one longitudinal half of the upright section having been illustrated in cross section.

30        Figure 11 is a view of the elements shown in Figure 10, in a position of mutual attachment at the node, there having been inserted between them, independently of the node, an internal insulation slab, supported only by the latticework structure.

Figure 12 is a perspective view of a façade panel at an angle in one possible stage prior to its final assembly positioning in a portion of latticework structure, accompanied by illustrative details.

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Figure 13 is a vertical cross section view of a building wall in which the device of Figures 10 and 11 has been used to effect the assembly of the façade panel to the latticework structure.

Figure 14 is also a schematic vertical cross section view of a joining node of a building, where the façade panel and the internal panel are independently attached to the latticework support structure.

Figure 15 is a perspective view of the visible faces of two façade panels where brickwork is imitated in relief and in which an arrangement according to the invention is adopted.

Figure 16 is a similar view to Figure 15 with two façade panels imitating natural stone masonry on the visible faces thereof.

Figure 17 is a side elevation view of the panel shown in Figure 12.

Figure 18 is a cross section view, in the molding stage, of an edge portion of the panel of Figure 12, where the panel has the visible face and the edges made from a different material than the rest of the panel body.

Figure 19 is a view similar to Figure 18, where the material constituting the visible face and the edges of the panel is the same as that of the resistant body.

Figure 20 is a schematic plan view of a plant for the manufacture of the panels according to the invention.

#### Detailed Description of the Invention

Figure 1 shows a building panel 1 having, according to the invention, a structure constituted by a patterned layer 2 which, molded in synthetic resin, forms the patterned surface of the visible face 3 of the panel and constitutes a sort of shell for the panel 1 which comprises the edges 3a.

The said external layer 2 comprises, over the entire inner surface thereof, an inner layer 4, also of synthetic resin, having the entire free surface thereof covered with a solid bulk material 5. The components of this material are firmly embedded in part in said inner layer 4 and provide a substantial free surface area for anchoring the material of the resistant body 6 applied thereover, which material fills the entire volume of the said

panel shell 1, at the same time as it includes therein reinforcement means 7, in general, which are provided with points directly accessible from the outside of the concealed face 8 of the panel 1, as may be seen in Figures 2, 3, 5, 6 and 9.

5           The solid bulk material 5 will preferably be constituted by an aggregate having a large specific area, such as a sand having sharp-edged angular grains, optionally uneroded, without dismissing, notwithstanding, other materials which may be suitable, such as grits, metal reinforcement fibers, metal shavings, etc.

10           The points of the reinforcement means 7 accessible from the outside are constituted by parts of said means, or members fixedly attached thereto, projecting out from the resistant body 6 on the concealed face 8 thereof, as may be seen in Figures 5, 6 and 9, forming an external surface to which screws may be applied.

15           The reinforcement means 7 may be of different shapes, according to the secondary function required of them. Thus, said means may consist of top-hat-shaped metal sections 7A or metal angle sections 7B, the latter being those which at the same time constitute the edges 3a of the panel 1, as may be seen in Figures 2 and 5 and in Figures 3, 6, 7, 8 and 9, respectively.

20           Where the top-hat-shaped metal sections 7A are used, they have a part 9 of the "U" portion projecting out from the surface of the concealed face 8 at the same time as the brim portions 10 thereof are applied to the anchorage surface formed by the solid bulk material 5 and optionally

25           attached thereto, by means of a filler material, such as a resin 11.

          Where the metal angle sections 7B are used, the web 12 thereof forms the edge 3a of the panel 1 and is wider than the thickness of the panel 1 and is folded orthogonally over a short distance parallel to the surface of the concealed face 8 of the panel 1 to form an anchoring wing 13

30           for use with screws. The tab 13 may be provided with a stiffening flange 14 directed towards the said concealed face 8. This section also forms a seating wing 10.

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In all the cases described, the metal reinforcement sections 7 are provided with apertures 15 in the webs and/or seating wings 10 thereof, which allow for the passage of the mass forming the resistant body 6, so as intimately to embrace part of the body of the metal sections 7.

5       The said metal sections 7 will preferably be located longitudinally relative to the panel 1. Nevertheless, some of said metal sections 7 may also be located crosswise, in which case a perimetral reinforcement frame will be formed, as may be seen in Figure 7.

10       Furthermore, the metal sections 7 forming the frame arrangement shown in Figure 7 may be accompanied by further similar metal sections which may be arranged parallel to one and/or the other of the sides of said frame arrangement.

15       Furthermore, as shown in Figure 8, the frame and metal section arrangements parallel to one or the other of the sides of the frame comprise corrugated rods 16 which are attached at the ends thereof to said frame arrangements and pass through the intermediate metal reinforcement sections, to which they are attached by welding or other means. These corrugated rods 16 may be accompanied, or replaced, by open metal fabrics, lightweight meshes, etc.

20       The resistant body 6 is formed by a material of the group comprising: cement concrete, cement mortar, resin mortar, mixed mortar and synthetic resins, either normal or lightened, alone or in combinations thereof or with other suitable materials, without excluding, therefore, other binding materials, such as lime mortar, plaster, etc.

25       Said resistant body 6 may be formed by a single layer, or an inner layer 6A of a heavy, air-setting resistant material, for the anchorage of the patterned layer and of part of the metal reinforcement sections 7, and an outer layer 6B of a lightweight resistant material, completing the thickness of the resistant body 6, conferring a greater thermal and acoustical  
30       insulating power thereon and forming the concealed surface 8 of the panel 1. This outer layer 6B may be preformed as a prefabricated slab of man-made or synthetic lightweight material or by a mixture of both.

The synthetic resin of the patterned layer 3 and of the inner layer 4, forming the shell of the panel 1, consists of a gel-coat of a resin preferably of the group formed by polyesters, polyurethanes, phenolic and epoxy resins, either alone or in combination, incorporating, in all cases, a base coloring agent and, optionally, ornamental and/or distinctive surface coloring arrangements.

Figure 9 illustrates a fragmentary cross section view of one side of an external closure panel 1. It is attached by means of a self-boring self-tapping screw 17 through the anchor wing 13 of the metal angle section 7B to a section 18 of a support structure. The said panel 1 is completed with an inner closure panel 19, of the plasterboard type, with the ensemble forming a wall for a building. Seals 20, which may be made from an elastomer, silicone, etc are provided between the juxtaposed edges of two adjacent panels 1. Raceways, insulation materials, etc., may conventionally be located between the panel 1 and the panel 19.

The façade panel 21 shown in Figure 10 is constituted by a resistant cement mortar body. Formed as a slab 22, the visible face 22A and the edges 22B thereof may be formed by another material, such as a synthetic resin, or another quality of the same material, such as a fine cement mortar paste. The visible face 22A may likewise have a smooth texture or a decorated texture with ornamental relief work imitating stone masonry, brickwork, wood, marble, etc, with or without color arrangements. The surface of the concealed face 22C will normally be a simple smoothed mortar mass.

The façade panel 21 is, furthermore, provided with a reinforcement constituted essentially by top-hat-shaped reinforcement sections 23 or the like, arranged in such a way that a spine 24, as shown in Figures 10 and 11, or a tab, such as the one as shown in Figures 6, 8 and 9, each parallel to the concealed face 22C, always projects out from said concealed face 22C of the slab 22 of the façade panel, and structured in frame-like form with internal stringers 23A and cross members 23B, as shown in Figure 12.

The lattice support structure 25 is constituted by upright sections 26, preferably having a right-angled "C" cross section, of which the longitudinal

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half has been illustrated in the majority of the Figures. They are connected together by top-hat-shaped cross member sections 27 having a spine 28 and are attached to the upright sections 26 by screws 29, rivets, welding or other means, forming rigid nodes at the intersections.

5 According to the invention, it is contemplated that some of the cross members of the reinforcement sections 23B of the façade panels may have the spines 24 confronting and touching the spines 28 of the cross member sections 27 of the lattice structure 25 in the final assembly position thereof, as shown in Figures 11 and 13, thereby allowing them to be attached  
10 together with screws 30, rivets or other mechanical fixation means.

Also, as shown in Figure 10, forming the main feature of the invention, it is contemplated that the spine 24 of the reinforcement sections 23B of the façade panels 21 be extended with an outstanding wing 31 parallel to the concealed face 22C of the slab 22 which, folded over 180°,  
15 forms a broad channel 32 which opens downwardly in the final assembly position.

Complementarily to the foregoing, the invention contemplates that the spine 28 of the cross member sections 27 of the lattice structure 25 extend outwardly forming a flange 33 which is directed in the opposite  
20 direction to the said broad channel 32 and is housed with a clearance therein in the final assembly position, as shown in Figure 11.

The façade panels 21 may be provided with a safety arrangement against accidental release, consisting of one of the reinforcement sections 23 of the top side of the frame housing longitudinally in the tubular conduit  
25 34 formed by the inner arch of the spine 24 with the concealed face 22C of the slab 22, a loose, resilient, resistant filiform member 35, such as a steel cable, a chain, etc., of closed contour, which may be firmly anchored to the lattice structure 25. Also, any other arrangement of the filiform member 35, which were not closed, would be adequate.

30 A façade wall made according to the invention is shown in Figure 13. It is to be seen here that the façade panel 21 is provided with two reinforcement sections 23A capable of engaging the corresponding flanges 33 of the cross member sections 27 of the lattice structure 25 by way of the

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channels 32 thereof. The upright sections 26 of the lattice structure have been drawn completely, with schematic graphic indication of the right-angled C-shaped section thereof.

Figure 13 also shows the arrangement of the internal slabs 36 of compound material, such as plasterboard, fiberboard, etc., which are in any case attached directly by screws 37 to the upright sections 26 and/or to the cross member sections 27, forming an insulating air space 38 housing the electricity, gas, water, telephone, etc. lines 39 and comprising a thermally and acoustically insulating fibrous material 40. The internal slabs 36A, as detailed in Figure 13, constitute the interior surface of the room.

As will be understood, the invention also contemplates the reverse case to the one shown, in which the reinforcement sections 23B are provided with a downwardly directed flange and the cross members 27 are provided with an upwardly open channel 32, in which said flange may engage.

The clearance 41 provided between the channel 32 and the flange 33 allows the flatness and vertical and horizontal alignment of one façade panel 21 to be adjusted relative to the adjacent façade panels.

The resilient filiform element 35, apart from its mission of assuring the façade panels 1 against accidental falling, may be used as suspension means for the façade panels 21 in the stages of assembly to the lattice structure 25 and handling thereof.

Figure 14 shows the case of a connecting node between the façade panels 21 and the lattice structure 25. It is to be seen that a reinforcement section 23C of the reinforcement 23 of the façade panel 21 is attached directly to the cross member 27A of the lattice structure 25 by means of the screw 30, which is also self-tapping and self-boring, while the internal slab 36 is mounted directly on the cross member sections 27C and upright section 26 of the support structure. In this way, it is possible on the one hand to make independent and assure the direct assembly of the façade panels 21 to said lattice structure 25, which panels are not affected by settling movements of the building, earthquakes, vibrations, etc. which may affect the structure, since they are capable of absorbing the stresses

produced by the deformation of the lattice structure 25 caused by such movements and, on the other hand, the arrangement of the internal slabs 36 fixed by screws 37 to the wings of the cross members 27A and to the uprights 26 themselves, or to both separately, means that said interior  
5 slabs act by compression, in their seat on the cross members 27A and uprights 26 and/or by tension, as struts, whereby the use of said herring-bone struts required in lattice work structures to prevent deformation of the parallelograms forming them, by converting such parallelograms in triangles, is obviated.

10 Figure 15 shows two façade panels 21, placed edge-to-edge, forming a conventional wall structure. In this case, the visible faces of the panels imitate brickwork laid in break-joint style, formed by horizontal rectangular relief elements 42, which reproduce the visual effect of a visible longer side of a brick and grooves 43, arranged horizontally relative to the  
15 relief elements and vertically, defining the break-joint position and reproducing the conventional mortar joints between them.

Figure 15 also shows the separation joint 44 between said two panels 21 and two depressed regions 45 which are aligned on both juxtaposed edges, each of which has the shape of half a visible brick side.  
20 These depressed regions 45 have a roughened surface and a shape, when taken together, equivalent to the longer visible face of the brick. A veneer block 46 reproducing the said longer visible side surface of the brick is firmly embedded in said depressed regions with mortar or other material.

Likewise, Figure 16 illustrates two façade panels 21A in which the  
25 visible face imitates natural stone masonry 47 formed by a plurality of relief elements which reproduce the visual effect of stones 47 substantially inlaid and attached by perimetral joints 48.

Also outstanding in Figure 16 is the separation joint 44 between said panels 21A and two depressed regions 45A which, together, have the  
30 shape of a stone. A veneer block 46A reproducing a natural stone 47 is firmly embedded therein with mortar or other material.

It is, therefore, obvious that with the system or arrangement of elements according to the invention, the object of the invention is achieved,

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assuring the attachment of the façade panels 21 and stabilizing the lattice support structure.

A façade panel 21, appropriate for manufacture in the plant according to the invention, is shown in particular in Figures 15a, 12, and 17  
5 to 19, where it will be seen that it is constituted by a cement mortar sheet 22 in which there is embedded a metal reinforcement 23.

The cement mortar slab 22, as shown in Figure 18, may have the visible face 22A and the edges 22B thereof formed by a thin compound layer 49 of a resin (gel coat), or by a simple layer of a fine cement mortar  
10 paste, provided in both cases with a pattern constituted by relief elements and/or color associations which configure architectural forms and/or imitate brickwork, natural stone, masonry, etc. Said layer 49 is firmly anchored by way of a second layer 50 to the body of the slab made from cement mortar. Figure 19 shows the case in which the visible face 22A of the façade panel  
15 21 is constituted by the same cement mortar as forms the body of the slab and is provided with normally simple relief elements, such as bush-hammering, graining, etc, to prevent the visible face of the panel from appearing to be brightly polished.

Figure 18 shows, further to the construction of the façade panel 21,  
20 the specific arrangement adopted for the molding thereof, which is formed by a mold carrier device 51, represented by a simple engraved metal sheet, an ornamentally patterned mold 52 of polyurethane, silicone or other materials and side members 53 which act as a frame and laterally hold said molds. In this case, the patterned mold 52 reproduces the negative image  
25 of the of the ornamentation it is desired to confer on the façade panel 21, such as brickwork, natural stone, masonry, wood, marble, etc.

Likewise, Figure 19 shows the molding arrangement for the façade panel 21 when the latter is not provided with the thin compound resin or simple cement mortar paste layer 49 and the visible face 22A and the  
30 edges 22B are constituted by the cement mortar itself of the body of the slab 22 of the façade panel 21. To this end, the molding arrangement is constituted by the carrier device 51, provided with a simple surface engraving for matting the surface of the visible face 22A of the façade panel



and by the side members 53. In this case, the steps obliging the use of the resins, the coarse grains and the polyurethane molds are omitted, whereby the panels are simpler, cheaper and quicker to manufacture. They are of special application in the construction of dignified social dwellings, dispensaries, schools and other constructions in which the external decoration is of secondary importance and only the comfort and security of the building matters.

A plant appropriate for the manufacture of the disclosed variations of façade panels 21 is illustrated in Figure 20 and corresponds to an actual premises of about one thousand square meters in area.

The installation of the Figure is provided with a track 54 for the movement of the not shown mold carrier devices, alone or with molds. The track, in this case, is constituted by two equal parallel portions 54A and 54B which are connected at the ends thereof by a transfer table 55 and a work station h.

The first track portion 54A comprises, successively, the following work stations appropriate for the manufacture of a façade panel 21 having an ornamental visible face, such as the one shown in Figure 20:

- (a) means for cleaning the molds, appropriate for removing any mortar and mold stripper remains deposited thereon,
- (b) means for changing the molds, to be used when the panel to be manufactured has different features from those of the panel which has been stripped from the mold, which means are complemented by shelving for use as a mold store,
- (c) means for applying a mold stripping product over the entire molding surface,
- (d) means for spraying a thin layer of a first resin (gel-coat) which waterproofs and enhances the pattern of the visible face of the panel,
- (e) a tunnel with shelving for storing the molds in the carriers thereof, in stand-by for the curing of the resin sprayed in the molds and/or for the following operation on the mold,

(f) means for spraying a thin layer of a second anchor resin on the first resin layer,

(g) means for spraying a layer of coarse grained sand, shot, etc. on the second resin layer, so as partly to incrust said coarse grains in the resin and for removing the grains not adhering thereto.

5

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From the first track portion 54A the operation transfers to the second track portion 54B by means of the tunnel h with shelving for storage of the carriers bearing the molds charged with both resins and the coarse grains incrustated in the second resin, in stand-by for the curing of the second resin and/or the following operation.

The remaining work stations are located on the second track portion 54B:

15

(i) means for pouring cement mortar, which is prepared from the cement, aggregate, water and additives drawn from silos adjacent the station,

(j) means for placing the reinforcement in the cement mortar and, optionally, a suspension cable for the panel anchored in said reinforcement,

20

(k) a tunnel kiln with shelving for the setting of the cement mortar, and

(l) mold stripping means and shelving for stacking the finished panels.

25

On the other hand, for the construction of a façade panel 21 as detailed in Figure 19, the sequence of operative stations would be as follows:

means for cleaning (a) the molding surfaces, appropriate for removing any mortar and mold stripper remains,

means for applying (c) a mold stripping product over the entire molding surface,

30

a tunnel (h) with shelving for storing the molds in the carrier devices therefor, in stand-by for the following operation,

means for pouring (i) cement mortar, which is prepared from the cement, aggregate, water and additives drawn from silos adjacent the station,

5 means for placing (j) the reinforcement in the cement mortar and, optionally, a suspension cable anchored in said reinforcement, a tunnel kiln (k) for the setting of the cement mortar, and mold stripping means (l) and shelving for stacking the finished panels.

10 Obviously, in the manufacture of the façade panels 21 of the type shown in Figure 19, specific stations remain inoperative in the plant and will be operative when manufacturing façade panels 21 like those shown in Figure 18.

15 When the manufacture of façade panels 21 according to Figure 18 were not contemplated in the plant, this would be reduced to the means and elements listed above and as defined in the second claim.

20 According to a preferred embodiment of the invention, the track 54 is arranged as a closed circuit on a horizontal plane, specially constituted by two straight, substantially parallel portions 54A and 54B connected together at the ends thereof by a work station h and/or transport means 55. Nevertheless, the two straight portions 54A and 54B could be disposed on parallel superimposed planes.

The track 54 is constituted by a rotating roller path, some of them being motorized.

25 The plant is completed by shelving 56 for the storage of polyurethane molds, with silos 57 for the cement and aggregate, with tanks 58 for the mortar additives, with a workshop 59 for the reinforcement 23 and with shelving 60 for stacking the finished façade panels 21.

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### CLAIMS

1.- A building panel and plant for the manufacture thereof, to be  
5 precise, a lightweight panel (1, 21) for external or internal closures of  
latticework support structures (18, 25), formed by uprights (18, 26)  
connected by horizontal crossmembers (27), which panel is formed by  
slabs (6, 22) of air-setting resistant material, reinforced in the façade panels  
for external closures and unreinforced for the dividing panels of internal  
10 closures, which have a patterned surface on the visible face (3, 22A) and a  
smooth or shaped surface at the edges (3a, 22B) thereof, which surface is  
formed by a thin layer (2, 49) of a synthetic resin or a fine mortar paste,  
said layer (2, 49) being formed as a shell partially enveloping a body (6,  
22) of air-setting resistant material on which it confers a quality finish of  
15 architectural type with essential properties of resistance to weathering and  
environmental pollution and being formed in molding arrangements  
constituted by a mold-holder (51) having an engraved bottom wall, on  
which there is seated the mold (52) forming the pattern of the visible face,  
the mold being made of polyurethane, silicone, etc and surrounded by side  
20 members (53) shaping the edges (3a, 22B) of the slabs (6, 22), said shell,  
after solidification, forming the mold for the said air-setting resistant  
material, wherein the molded synthetic resin layer (3, 22A), arranged in  
shell-like fashion in the panel (1, 21) comprises over the whole of the inner  
surface thereof an internal layer (4), also of synthetic resin, having the  
25 whole of the free surface thereof covered with a solid bulk material (5), the  
components of which, being partly firmly anchored in said internal layer (4)  
provide a substantial free surface for the anchorage of the air-setting  
material forming the resistant body (6, 22) poured thereover, which fills the  
entire volume of said panel shell, at the same time as it includes therein  
30 reinforcement means (7A, 7B, 23) provided with points directly accessible  
from the outside of the concealed face (8, 22C) of the panel (1, 21).

2.- The panel of claim 1, wherein the solid bulk material (5) is  
formed by an aggregate having a large specific surface area.

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3.- The panel of claim 2, wherein the large specific surface area aggregate consists of a sand formed by sharp-edged angular, preferably non-eroded grains.

4.- The panel of claim 1, wherein the points of the reinforcement  
5 means (7A, 7B,23) accessible from the outside are located in such way that they clearly project out from the surface of the concealed face (8, 22C) of the panel (1, 21).

5.- The panel of claim 4, wherein the points of the reinforcement  
10 means (7A, 7B,23) accessible from the outside are formed by portions of said reinforcement means emerging from the resistant body of the panel on the concealed face (8, 22C) thereof.

6.- The panel of claim 4, wherein the reinforcement means (7A, 7B,23) comprise top-hat-shaped metal sections having a portion (9, 24) of the U-shaped part thereof extending from the surface of the concealed face  
15 (8, 22C) of the panel (1, 21), and the brim portions (10) engaging the surface comprising the solid bulk material (5).

7.- The panel of claims 1 and 4, wherein the reinforcement means (7B) comprise metal sections constituting the visible face (12) of the edges (3a) of the panel (1).

20 8.- The panel of claims 4 and 7, wherein the section (7B) constituting the edges of the panel is an angle section and the web (12) thereof is wider than the thickness of the edges and is folded orthogonally parallel to the surface of the concealed face of the panel to form an anchorage tab (13), which may have a stiffening flange (14) directed  
25 towards the surface of said concealed face (8) of the panel (1).

9.- The panel of claim 6, wherein the brim portions (10) of the top-hat-shaped sections (7A) are attached to the surface comprising the solid bulk material (5) on which they are seated by a filler material (11).

10.- The panel of claims 6 and 7, wherein the metal sections (7A, 7B, 23) are provided with apertures (15) in the webs and/or seating wings  
30 thereof allowing the passage of the mass of resistant material of the body (22), so as intimately to embrace) part of the body of the metal sections (7A, 7B, 23).

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11.- The panel of claims 6 and 7, wherein some of the metal sections (7A, 7B, 23) are situated lengthwise (23A) and others crosswise (23B) relative to the panel (21), forming a frame arrangement.

12.- The panel of claim 11, wherein the metal sections (7A, 7B, 23) forming the frame arrangement may be accompanied by other metal sections disposed parallel to one and/or the other of the longer and shorter sides of said frame arrangement.

13.- The panel of claim 12, wherein the arrangements of frame and of metal sections parallel to the frame arrangement comprise corrugated rods (16) transversely crossing said frame arrangements and metal sections (7A, 7B), said rods being fixedly attached to points thereof.

14.- The panel of claim 6, wherein the crossmembers (27) of the lattice-like support structure (25) and a part of the reinforcement (23B) of the slabs (22) of the façade panels (21) projecting from the concealed face (22C) thereof are constituted by top-hat-shaped metal sections which are respectively arranged in such a way that, on assembly, said sections are mutually confronting and in engagement by the spines (24, 28) thereof and the latter are provided with an outstanding extension (31) which, in the façade panels (21), forms a wide channel (32) which, in the final assembly position, opens downwardly and which, in the crossmembers (27) of the lattice structure (25), forms a flange (33) which, directed in the opposite direction to said channel (32), is loosely housed therein in the assembly, or vice versa.

15.- The panel of claim 14, wherein the housing clearance (41) in the channel (32) of the reinforcement section (23B) of the façade panel (21) of the flange (33) of the cross member section (27) of the lattice structure (25) is of appropriate magnitude for positionally adjusting the façade panel relative to the adjacent panels in respect both of the vertical and horizontal alignment and of the coplanarity thereof.

16.- The panel of claim 14, wherein the spines (28) of the cross members (27) of the lattice structure (25) and the spines (24) of the reinforcements (23B) of the slabs (22) of the façade panels (21), which are

substantially mutually contacting, are firmly attached together by mechanical fixation means (30) in the final assembly thereof.

17.- The panel of claim 14, wherein the top-hat-shaped reinforcement section (23B) of the upper side of the frame of the slabs (22) of the façade panels (21) houses longitudinally in the tubular duct (34) it forms with the concealed face (22C) of the slab (22) of the façade panels (21) a loose resilient, resistant filiform member (35) of closed contour, which may be firmly anchored to the lattice structure (25).

18.- The panel of claim 1, wherein the resistant material of the body (22) is preferably one of the group formed by: cement concrete, cement mortar, resin mortar, mixed mortar and synthetic resins, either normal or lightened, alone or in combinations thereof.

19.- The panel of claim 18, wherein the resistant body (22) of the panel (21) may be formed by an inner layer (6A) of a heavy resistant material, for the anchorage of the patterned layer (2, 4) and of part of the metal reinforcement sections (7A, 7B), and an outer layer (6B) of a lightweight resistant material, completing the body, conferring a greater thermal and acoustical insulating power thereon and forming the concealed face of the panel.

20.- The panel of claim 19, wherein the outer layer (6B) of the lightweight resistant material may be preformed as a slab.

21.- The panel of claim 1, wherein the synthetic resin of the layer (2, 49) molded as a shell consists of a gel-coat of a resin of the group which, preferably, is formed by polyesters, polyurethanes, phenolic resins and epoxy resins, either alone or in combination, and incorporating, in all cases, a base coloring agent and, optionally, ornamental and/or distinguishing surface coloring arrangements.

22.- The panel of claim 1, wherein the edges of the sides of the panel (21, 21A) to be placed juxtaposed to those of other panels are provided, at the places on the visible face thereof where the joints (44) cut across the relief of the pattern design, with slightly depressed areas (45, 45A), with those on the edge of one panel (21) mating with those on the adjacent edge of the other panel (21, 21A), which, once the panels (21) are

installed, define depressed façade areas affecting part or the whole of the joint and in which there are fitted inserts (46, 46A) bearing the relief elements of the pattern design constituting the continuation of the relief elements of the pattern design on the visible faces of the juxtaposed panels (21, 21A).

23.- The panel of claim 1, in the case of assembly of internal slabs (36) of plasterboard, fiberboard, etc. between a façade panel (21) and an internal closure slab (36A), jointly to form a wall including an air space (38) and a thermal and acoustical insulation and moisture proofing arrangement (40), wherein the internal slab (36) is applied directly, independently of the façade panel (21), to the support structure (25), in such a way that it occupies one or more cells thereof and is flanked, in any case, by the corresponding upright (26) and transverse (27) sections, to which it is directly solely attached by screws (37) or other means, at the wings thereof.

24.- The panel of claim 23, wherein the internal slabs (36) are at least anchored to end points of the support structure lattice (25), occupying one or more of the cells thereof, in such a way as to replace the conventional braces.

25.- A plant for manufacturing a building panel comprising a track (54) for the movement of carrier devices (51) for the molds forming the façade panel (21) on which there are situated sequentially according to the operative stages required for the manufacture of the façade panel (21), a number of work stations which, defined by the means and/or members pertaining to the work stage proper thereto are listed in order below:

- (a) means for cleaning the molds, appropriate for removing any mortar and mold stripper remains,
- (b) means for changing the molds, to be used when the panel to be manufactured has different features from those of the panel which has been stripped from the mold, which are complemented by shelving for use as a mold store,
- (c) means for applying a mold stripping product over the entire molding surface,



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- 5 (d) means for spraying a thin layer of a first resin (gel-coat) which waterproofs and enhances the pattern of the visible face of the panel,
- (e) a tunnel with shelving for storing the molds in the carriers thereof, in stand-by for the curing of the resin sprayed in the molds and/or for the following operation on the mold,
- (f) means for spraying a thin layer of a second anchor resin on the first resin layer,
- 10 (g) means for spraying a layer of coarse sand on the second resin layer, so as partly to incrust the coarse grains of sand in the resin and for removing the sand not adhering thereto;
- 15 (h) a tunnel with shelving for storage of the carriers bearing the molds charged with both resins and the coarse grains of sand incrustated in the second resin, in stand-by for the curing of the second resin and/or the following operation,
- (i) means for pouring cement mortar which is prepared from the cement, aggregate, water and additives drawn from silos adjacent the station,
- 20 (j) means for placing the reinforcement in the cement mortar and, optionally, a suspension cable for the panel anchored in said reinforcement,
- (k) a tunnel kiln with shelving for the setting of the cement mortar, and
- 25 (l) mold stripping means and shelving for stacking the finished panels.

26.- The plant of claim 25, wherein when the resins in the façade panel (21) are not used, the sequence of operative work stations is reduced to the following:

- 30 means for cleaning (a) the molding surfaces, appropriate for removing any mortar and mold stripper remains,
- means for applying (c) a mold stripping product over the entire molding surface,

a tunnel with shelving (h) for storing the molds in the carrier devices thereof, in stand-by for the following operation,

means for pouring (i) cement mortar, which is prepared from the cement, aggregate, water and additives drawn from silos adjacent the station,

means for placing (j) the reinforcement in the cement mortar and, optionally, a suspension cable anchored in said reinforcement,

a tunnel kiln (k) for the setting of the cement mortar, and

mold stripping means (l) and shelving for stacking the finished panels.

27.- The plant of claim 25, wherein the track (54) is disposed in closed circuit form.

28.- The plant of claim 27, wherein the track (54A, 54B) is disposed on a horizontal plane.

29.- The plant of claim 27, wherein the track (54) is disposed in divided form on two superimposed parallel planes.

30.- The plant of claims 27, 28 and 29, which is constituted by two substantially parallel straight portions (54A, 54B) connected at the ends thereof by a work station (h) and/or transport means (55).

31.- The plant of claims 25 and 26, wherein the shelving tunnels (a, k) are provided with means for heating and/or stacking the loaded mold carriers.

32.- The plant of claim 25, wherein the track (54) is constituted by a rotary roller path, some of which are motorized.

## A BUILDING PANEL AND PLANT FOR THE MANUFACTURE THEREOF

ABSTRACT

5        This building panel consists of a lightweight panel for external or  
internal closures of latticework support structures, which is constituted by  
slabs of air-setting resistant material. The slabs are reinforced in the façade  
panels for external closures and unreinforced for the dividing panels for  
internal closures. They are provided with a patterned surface on the visible  
10    face and are smooth or shaped at the edges. The visible face is formed by  
a thin layer of molded synthetic resin or fine mortar paste. When the layer is  
molded synthetic resin and is disposed as a shell for the panel, it comprises  
over the whole of the inner surface thereof an internal synthetic resin layer,  
the entire free surface of which is covered with a solid bulk material, the  
15    components of which are firmly partially anchored in said internal layer and  
afford a substantial free surface for anchorage of the air-setting material  
forming the resistant body poured thereover. This material fills the entire  
volume of said panel shell, at the same time as it includes therein  
reinforcement means provided with points directly accessible from the  
20    outside of the concealed face of the panel.

Figure 5.

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FIG. 1

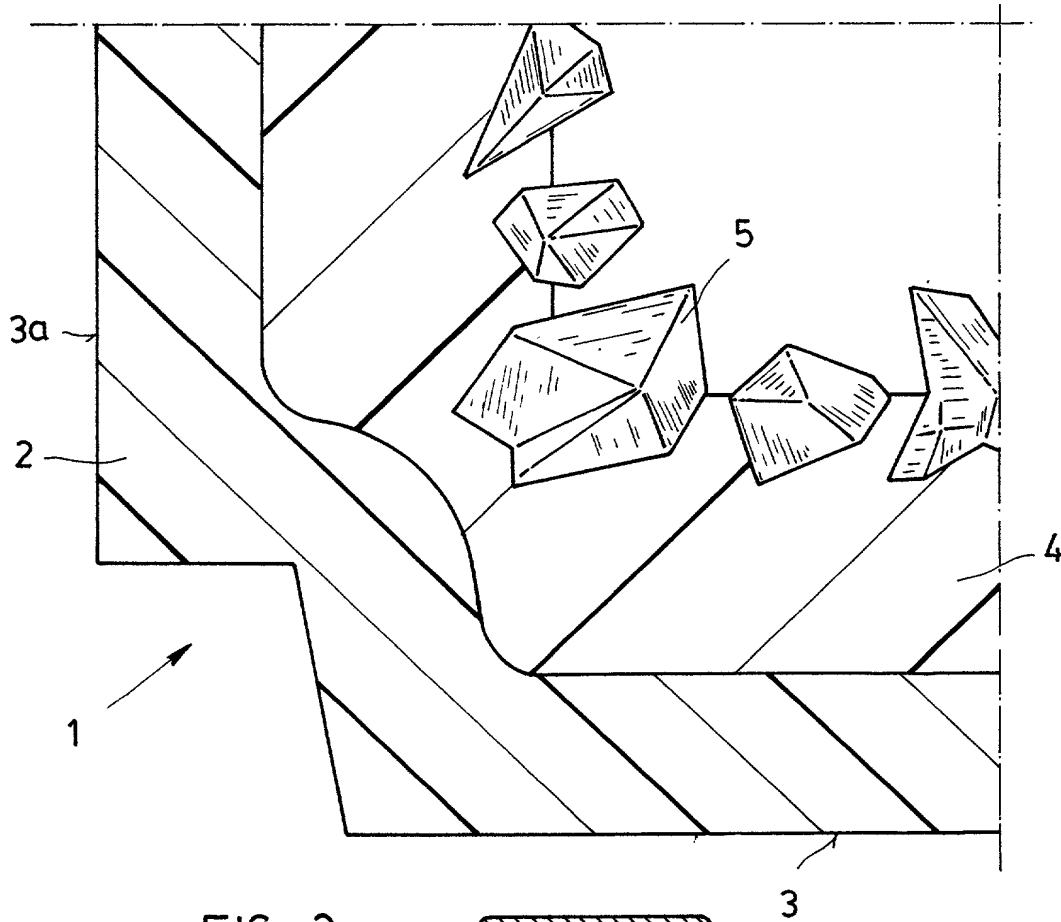
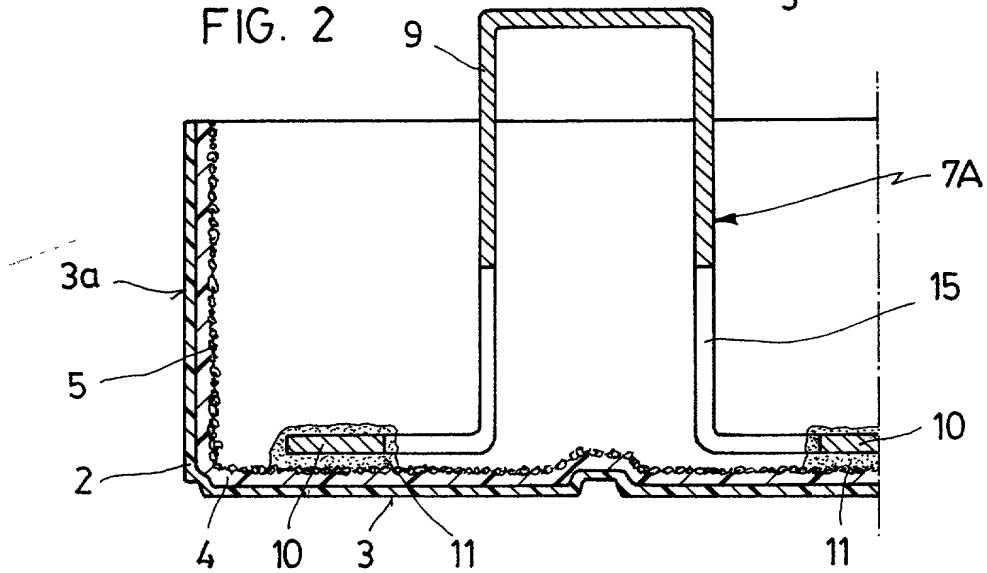
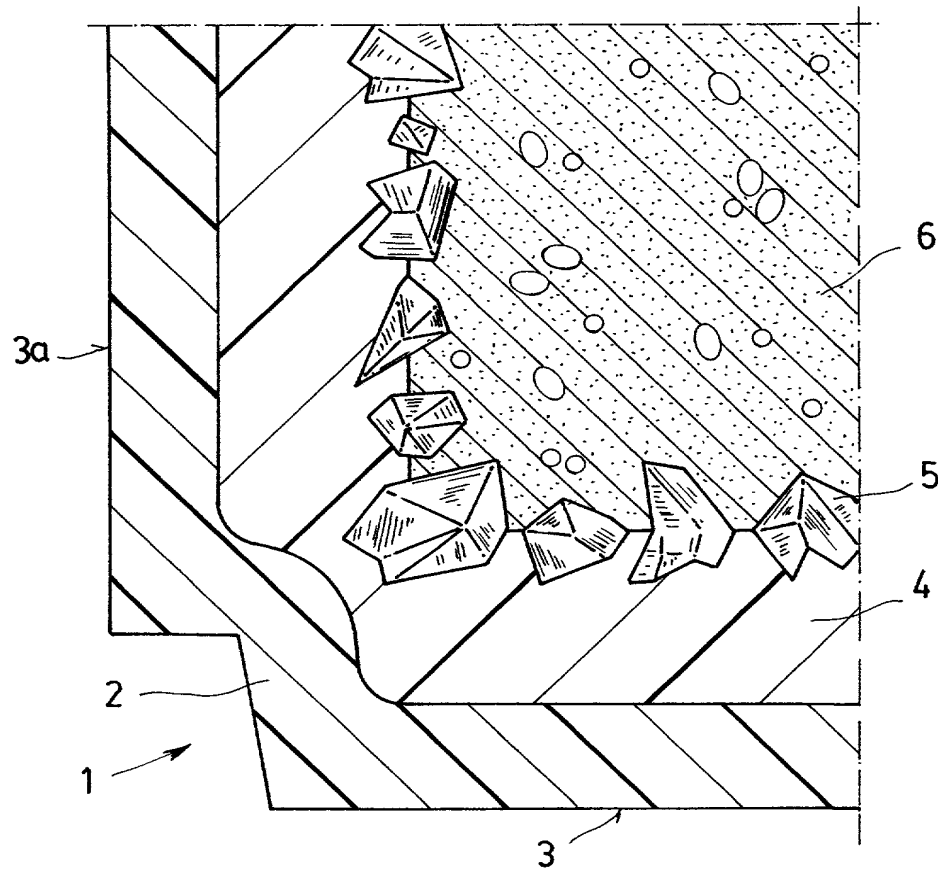


FIG. 2





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FIG. 5

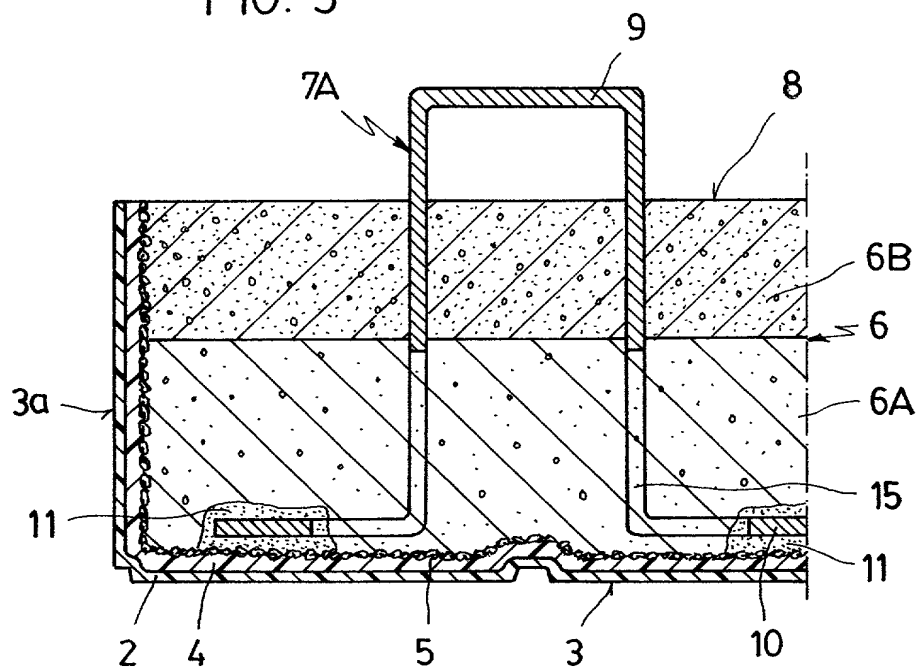
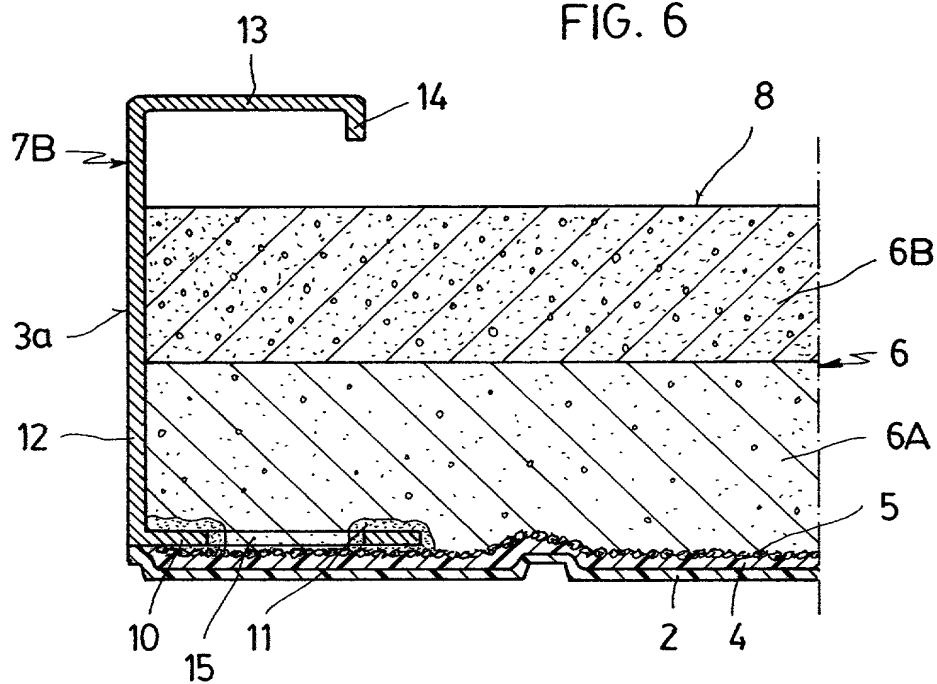


FIG. 6



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FIG. 7

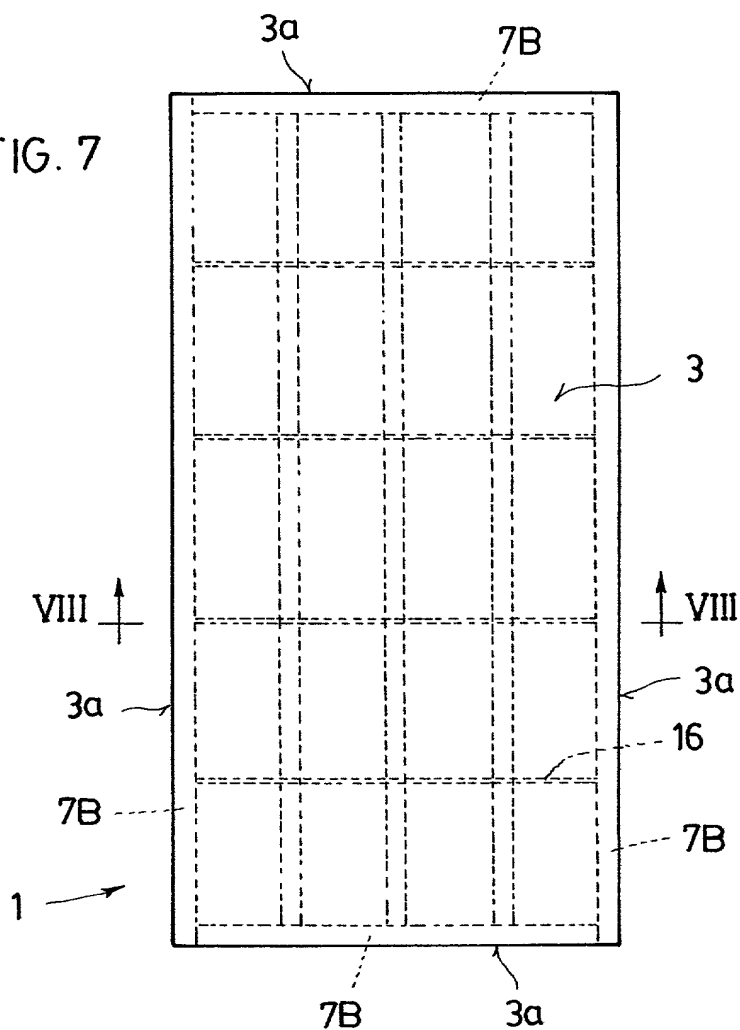
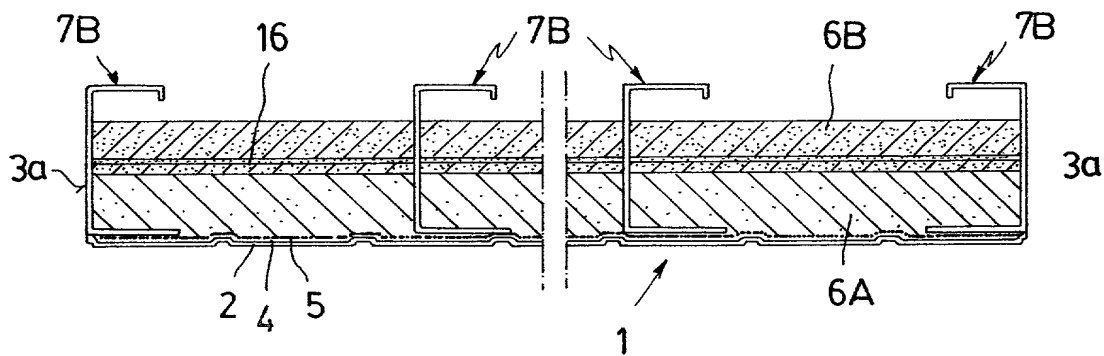


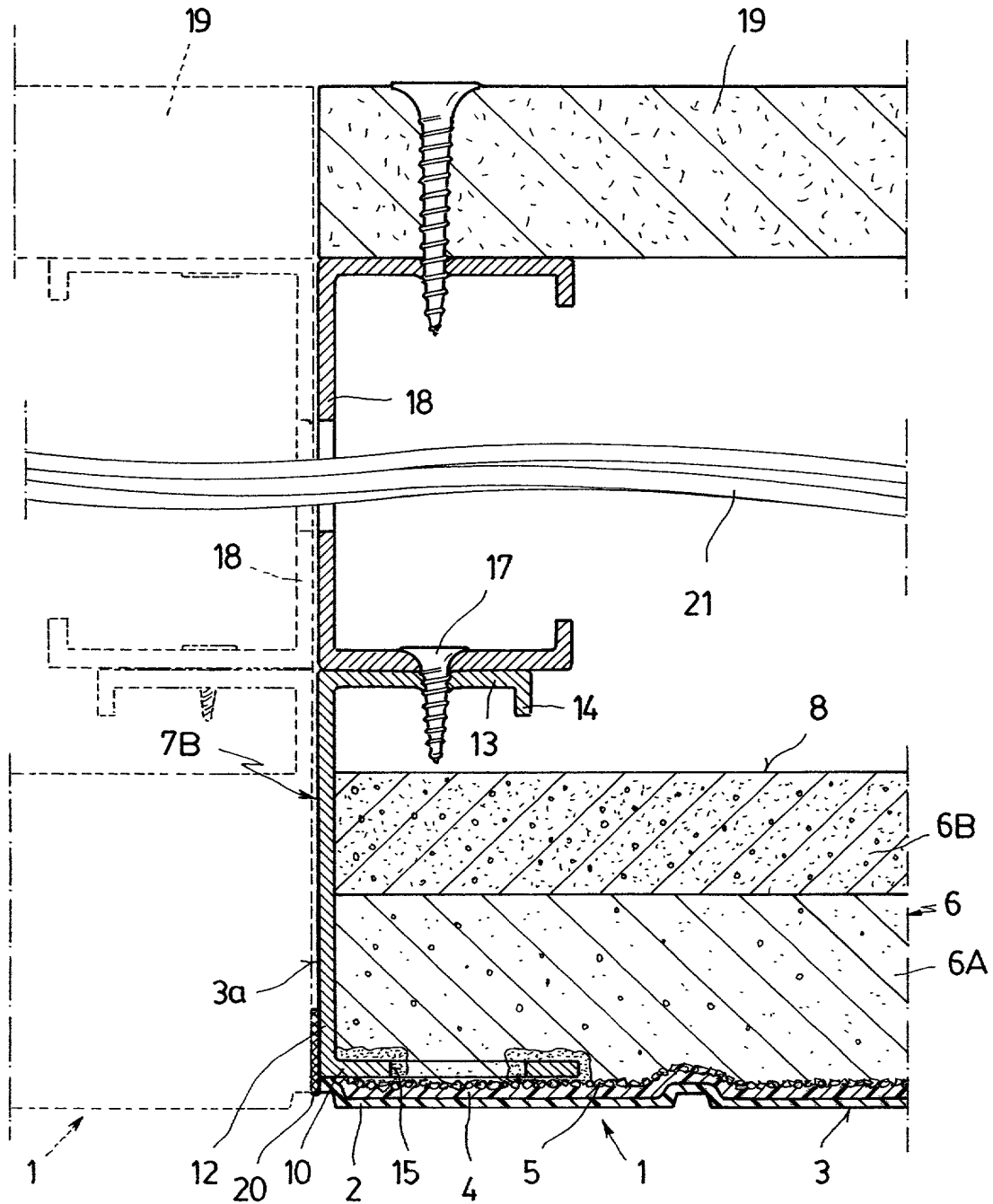
FIG. 8



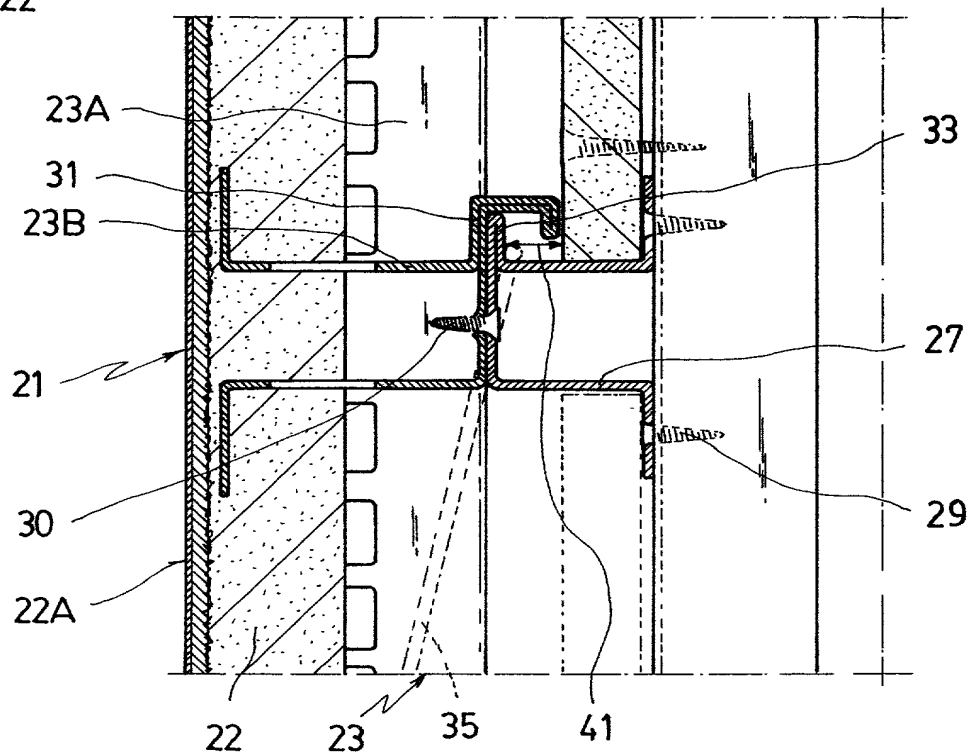
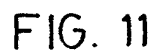
10/030679

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FIG. 9

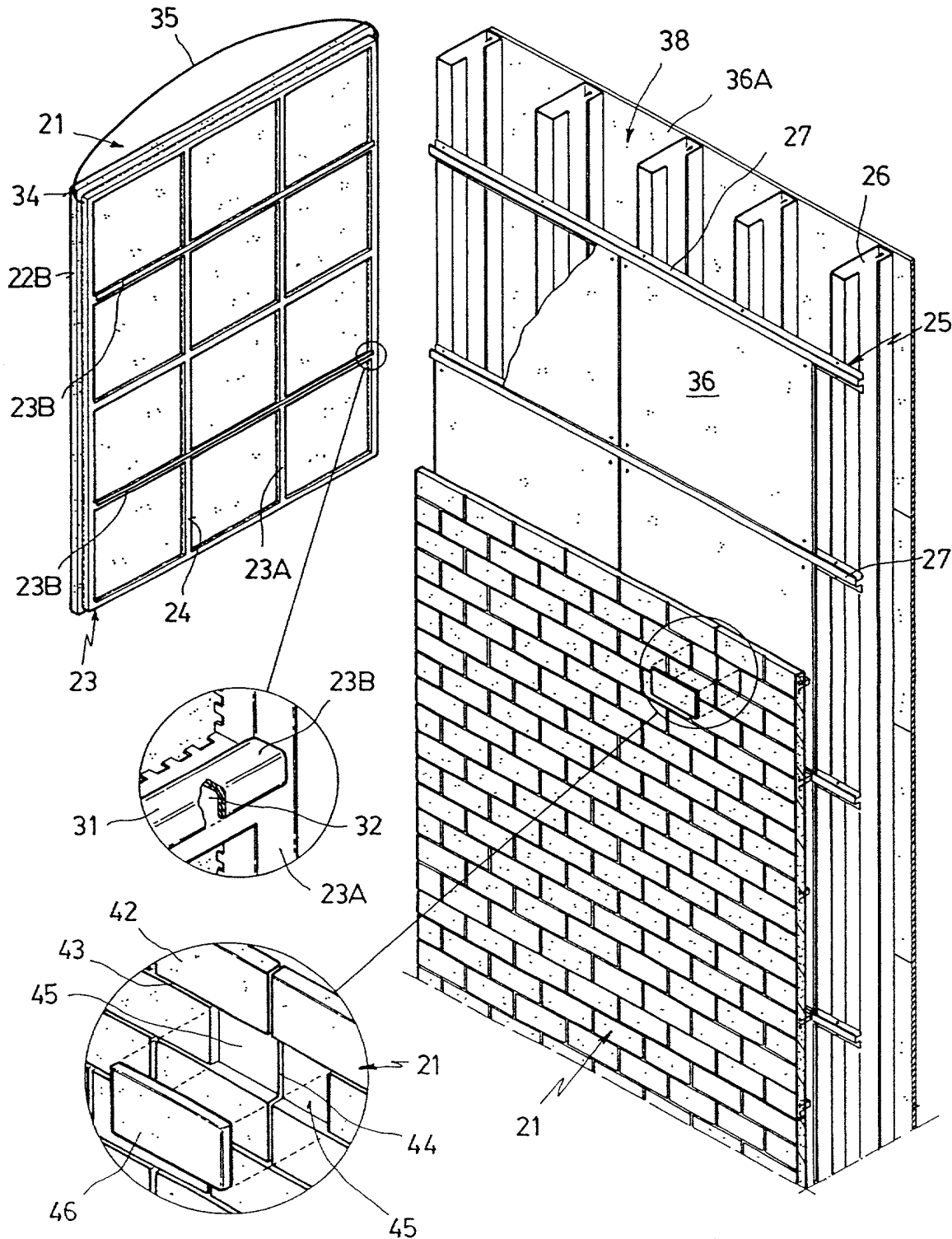






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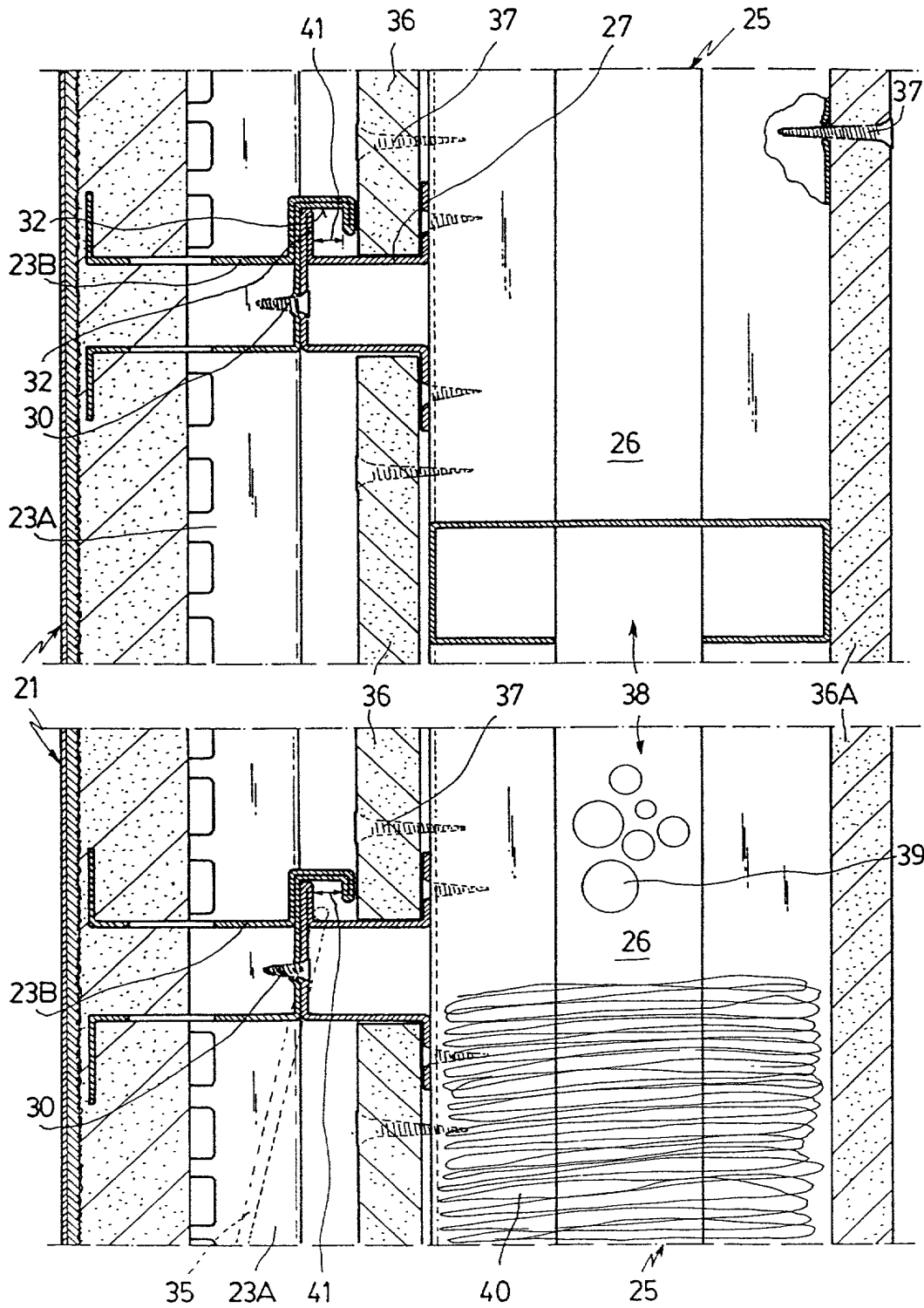
FIG. 12



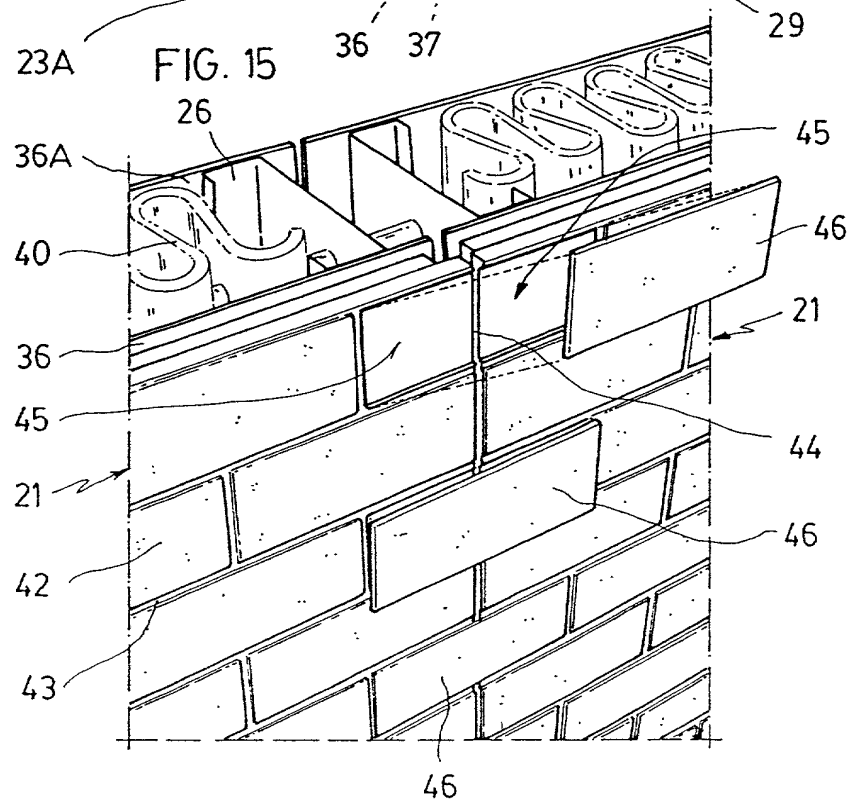
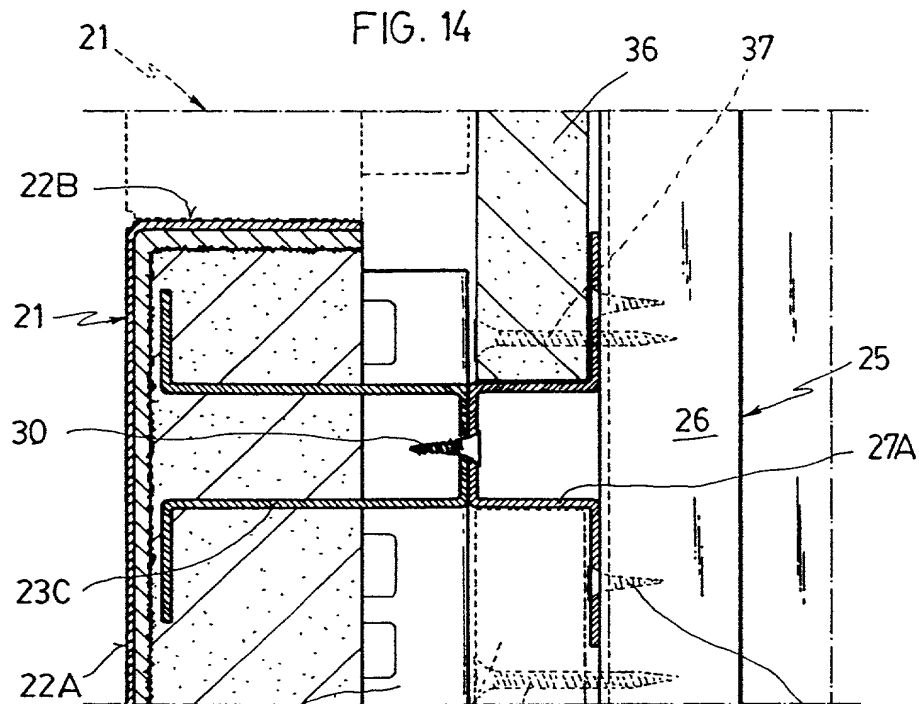
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FIG. 13



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Parameter	Value	Unit
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2. $\beta$	0.01	
3. $\gamma$	0.01	
4. $\delta$	0.01	
5. $\epsilon$	0.01	
6. $\zeta$	0.01	
7. $\eta$	0.01	
8. $\theta$	0.01	
9. $\iota$	0.01	
10. $\kappa$	0.01	
11. $\lambda$	0.01	
12. $\mu$	0.01	
13. $\nu$	0.01	
14. $\xi$	0.01	
15. $\omicron$	0.01	
16. $\pi$	0.01	
17. $\rho$	0.01	
18. $\sigma$	0.01	
19. $\tau$	0.01	
20. $\upsilon$	0.01	
21. $\phi$	0.01	
22. $\chi$	0.01	
23. $\psi$	0.01	
24. $\omega$	0.01	
25. $\Omega$	0.01	
26. $\Theta$	0.01	
27. $\Phi$	0.01	
28. $\Psi$	0.01	
29. $\Xi$	0.01	
30. $\Upsilon$	0.01	
31. $\Gamma$	0.01	
32. $\Delta$	0.01	
33. $\Sigma$	0.01	
34. $\Pi$	0.01	
35. $\Lambda$	0.01	
36. $\Omega$	0.01	
37. $\Theta$	0.01	
38. $\Phi$	0.01	
39. $\Psi$	0.01	
40. $\Xi$	0.01	
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42. $\Gamma$	0.01	
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46. $\Lambda$	0.01	
47. $\Omega$	0.01	
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53. $\Gamma$	0.01	
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61. $\Psi$	0.01	
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80. $\Omega$	0.01	
81. $\Theta$	0.01	
82. $\Phi$	0.01	
83. $\Psi$	0.01	
84. $\Xi$	0.01	
85. $\Upsilon$	0.01	
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100. $\Pi$	0.01	

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FIG. 16

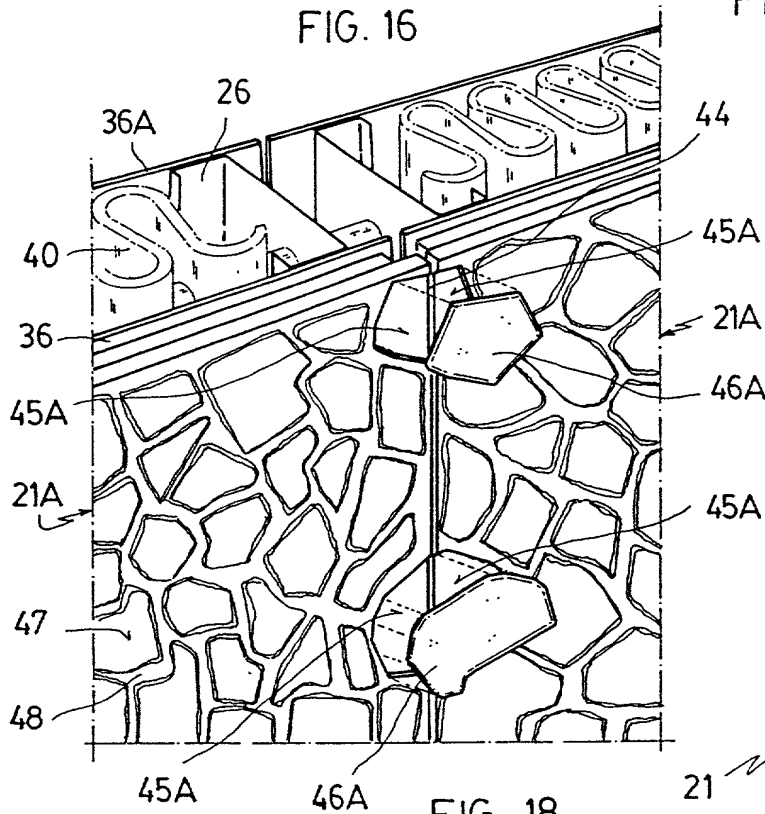


FIG. 17

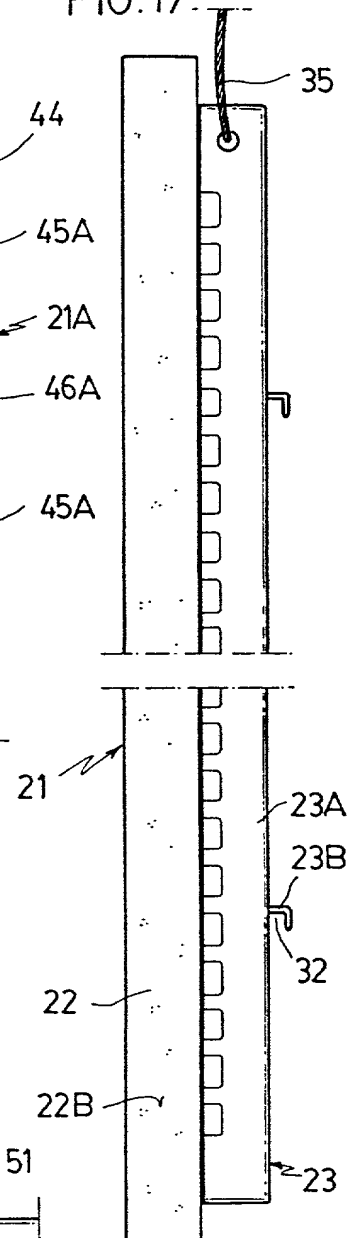


FIG. 18

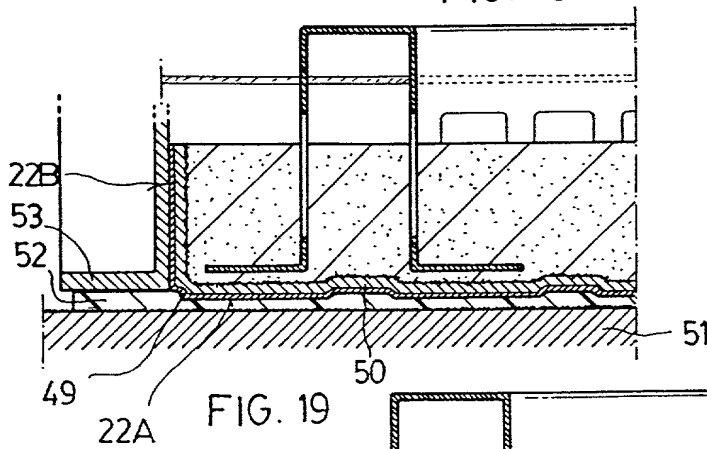
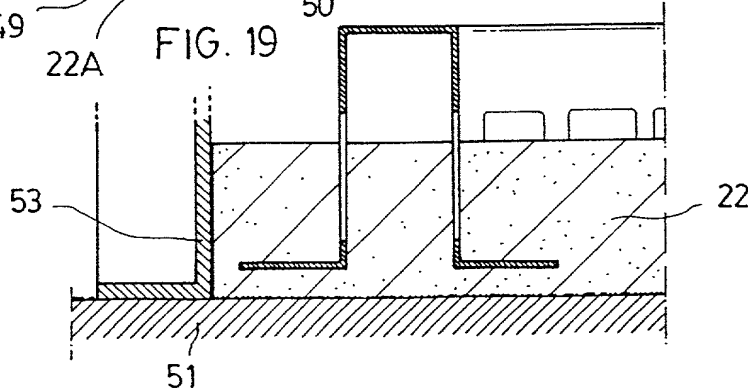


FIG. 19

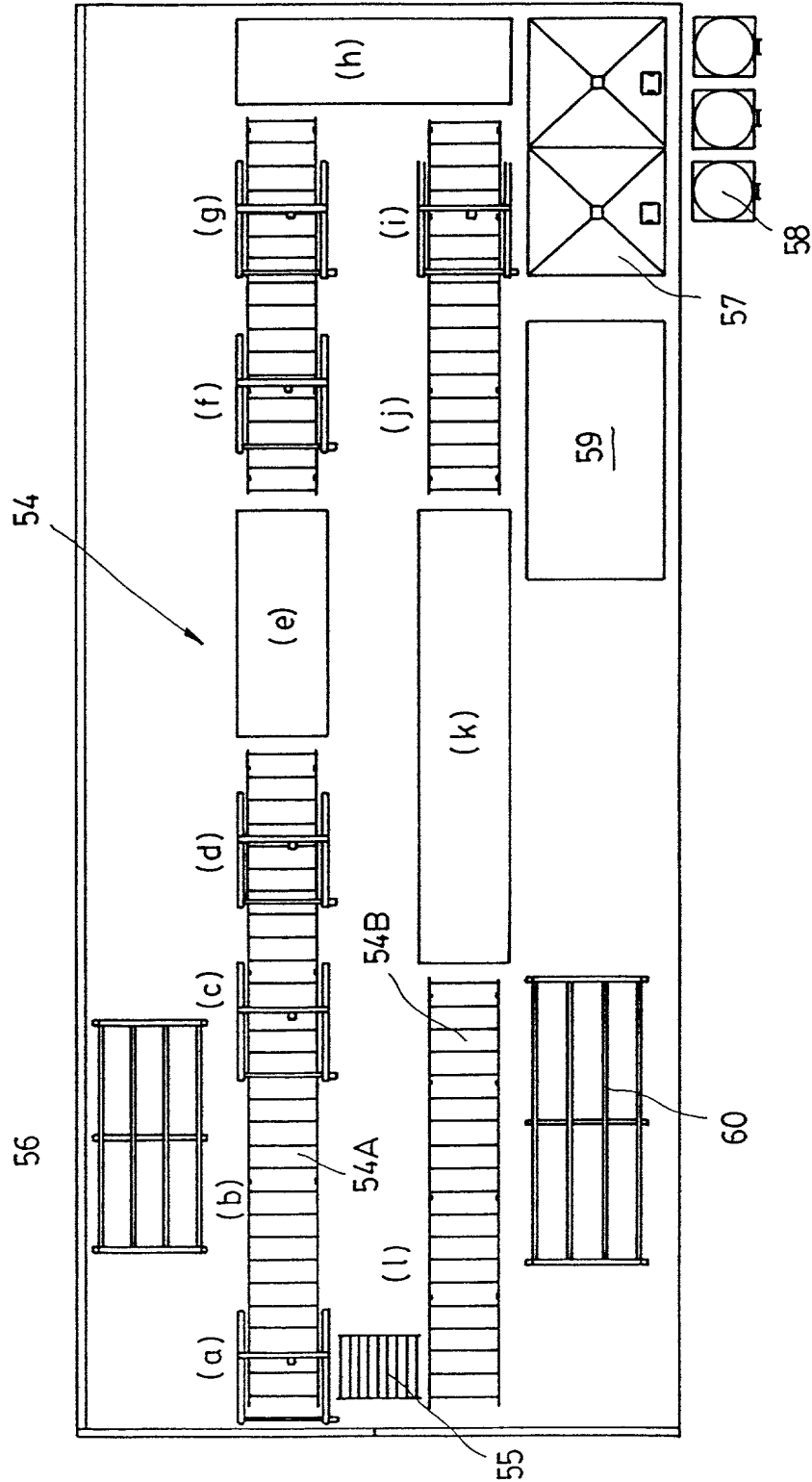


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FIG. 20



**DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION**

(Foreign Agent Involved)

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

**A BUILDING PANEL AND PLANT FOR THE MANUFACTURE THEREOF**

the specification of which is attached hereto unless the following box is checked:

☒ was filed on July 12, 2000 as United States Application Number or PCT InternationalApplication Number PCT/ES00/00247 and was amended on \_\_\_\_\_ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR §1.56

I hereby claim foreign priority benefits under 35 U.S.C. §119(a)-(d) or §365(b) of any foreign application(s) for patent or inventor's certificate, or §365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application(s)			Priority Claimed	
<u>9901847</u>	<u>Spain</u>	<u>13 July 1999</u>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
(Number)	(Country)	(Day/Month/Year Filed)	Yes	No
<u>200000382</u>	<u>Spain</u>	<u>17 February 2000</u>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
(Number)	(Country)	(Day/Month/Year Filed)	Yes	No
<u>200000544</u>	<u>Spain</u>	<u>2 March 2000</u>		
(Number)	(Country)	(Day/Month/Year Filed)	Yes	
<u>200000545</u>	<u>Spain</u>	<u>2 March 2000</u>		
(Number)	(Country)	(Day/Month/Year Filed)	Yes	
<u>200000616</u>	<u>Spain</u>	<u>8 March 2000</u>		
(Number)	(Country)	(Day/Month/Year Filed)	Yes	
(Number)	(Country)	(Day/Month/Year Filed)	Yes	

I hereby claim the benefits under 35 U.S.C. § 119(e) of any United States provisional application(s) listed below.

(Number)

(Filing Date)

(Number)

(Filing Date)

I hereby claim the benefit under 35 U.S.C. § 120 of any United States application(s), or § 365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C., § 112, I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR § 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

(Appln. Serial No.)

(Filing Date)

(Status --patented/pending/aban.)

(Appln. Serial No.)

(Filing Date)

(Status --patented/pending/aban.)

The undersigned hereby authorizes the U.S. attorney or agent named herein to accept and follow instructions from my Spanish representative, Dr. Ing. M. Curell Sunol I.I.S.L., as to any action to be taken in the U.S. Patent and Trademark Office regarding this application without direct communication between the U.S. attorney or agent and the undersigned. In the event of a change in the persons from whom instructions may be taken, the U.S. attorney or agent named herein will be so notified by the undersigned.

I hereby appoint the practitioners associated with the Customer Number provided below to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith, and direct that all correspondence be addressed to that Customer Number:

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Tel Charlotte Office (704) 331-6000

Fax Charlotte Office (704) 334-2014

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.



1-00

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Residence:

Citizenship:

Post Office Address:

Full name of ~~fourth~~ <sup>third</sup> inventor:

Inventor's Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Residence:

Citizenship:

Post Office Address: